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The Role of New Electronic Software in School Learning Google Classroom as an Example: Peran Perangkat Lunak Elektronik Baru dalam Pembelajaran di Sekolah Google Classroom sebagai Contoh

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General Background: Digital learning platforms have become central to contemporary education, with Google Classroom widely adopted to streamline instruction and communication. Specific Background: Although its use expanded rapidly during and after the pandemic, empirical evidence on its measurable effects on student performance and user experience remains uneven across contexts. Knowledge Gap: Limited studies have simultaneously assessed both academic outcomes and stakeholder perceptions using robust mixed-method designs. Aims: This study investigates the impact of Google Classroom on student achievement, engagement, and user satisfaction while identifying implementation challenges. Results: Quantitative findings show significant improvements in assignment completion, test scores, and participation among Google Classroom users, while qualitative data reveal strong appreciation for accessibility, timely feedback, and collaborative tools, alongside notable technical difficulties reported by both teachers and students. Novelty: The integration of performance metrics with multi-level experiential data provides a comprehensive evaluation of platform effectiveness beyond conventional usage studies. Implications: The study highlights that Google Classroom can enhance learning efficiency when supported by adequate infrastructure, teacher training, and equitable access, offering evidence to guide policy decisions and best practices in digital learning integration.
Highlights :

- Shows clear improvements in assignment completion, test scores, and overall participation.
- Emphasizes strong benefits in accessibility, collaboration, and feedback speed.
- Highlights technical issues as a key barrier requiring better infrastructure and support.

Keywords: Google Classroom, e-learning, educational technology, digital pedagogy, student performance

Introduction

Digital transformation, as an education reform, has become one of the most critical paradigm shifts for contemporary education, changing the way knowledge is distributed, accessed, and processed. In this newly shaping educational territory, Learning Management Systems (LMSs) emerged as key infrastructures with Google Classroom being one of the most widely adopted. The COVID-19 pandemic acted as a crucial driver of that educational transformation, which forced educational organisations around the world to quickly pursue digital solutions to continue the learning. In other words, the emergency transition, which began with pandemic closure, steered into an ongoing movement towards hybrid and technology-mediated models of learning in the post-pandemic period.

Launched in 2014 as part of Google's Workspace for Education, Google Classroom supports over 150 million students and educators from around the world (Google). Google Classroom is widely popular because it is user-friendly; it integrates seamlessly with other Google products, and it is typically less costly than traditional LMSs. The learning platform includes tools for assignment distribution, auto grading, open discussion forums, and real-time collaboration tools - which are all designed to improve educational efficiency and enhance the educational process. Nonetheless, although there has been widespread use of this platform, there is need to conduct research on its effectiveness and some of the challenges of using it in classroom.

This study is being conducted at a pivotal moment in educational technology research. Numerous studies have documented benefits of LMS use in general. However, a significant gap exists regarding how specific platforms, such as Google Classroom, have impacted measurable learning outcomes across various educational settings. Further, with the rapid advancement of technology, much of the existing research has lagged, particularly in terms of the longer-term effects of prolonged use of platforms. This study aims to contribute to filling in the above research gaps using a rich mixed methods approach, one that combines a quantitative analysis of academic performance and qualitative data from educators and students.

This study is important, as it can provide evidence-based decision making across all levels of the educational policy and educational practice. School administrators can look at the concrete data to see a return-on-investment for their technology budget, for teachers, we can develop practical implications for teachers related to best practices of using the platform, for the policy maker, it opens up the door to a systemic issue such as the digital divide that may still be impacting equitable access when it comes to educational technology. Furthermore, as we are in an era of accountability in education, this study will also help better understand how specific tools can be used to achieve important educational goals, all ranging from improved test scores, to enhancing 21st century skills such as collaboration and digital literacy

The study is informed by both educational psychology theoretical frameworks and technology adoption. In particular, through the lens of constructivist learning theory, we explore how Google Classroom supports social learning and the construction of knowledge and through the Technology Acceptance Model we investigate various aspects of factors that influence educator adoption and sustained use of the platform. Using both of these related yet separate theoretical frameworks illuminates the nuanced exploration of Google Classroom's involvement in 21st century education, in terms of both its pedagogical effectiveness and the challenges of implementation.

As we are at an intersection of educational reform and technological innovation, this study aims to situate itself as empirical evidence to assist with the thoughtful integration of digital tools in the classroom. We intend to explore both the advantages but also limitations of Google Classroom implementation for educators, ultimately to build best practices that promote further engagement while minimizing adverse or unintended consequences, to ultimately support more effective, equitable, and engaging learning environments for students.

Literature Review

2.1 Evolution of Digital Learning Platforms

Early LMS like Moodle required technical expertise, whereas Google Classroom's user-friendly design democratized access. Its integration with Google Workspace supports collaborative knowledge construction, aligning with social constructivism.

2.2 Benefits and Challenges

Benefits:

1. Increased engagement through interactive features
2. Efficient feedback loops
3. Reduced administrative burdens

Challenges:

1. Digital inequities
2. Teacher resistance due to inadequate training
3. Privacy concerns

Methodology

3.1 Research Design

Mixed-methods approach:

1. Quantitative: Academic performance metrics from 500 students (250 Google Classroom users, 250 controls)
2. Qualitative: Semi-structured interviews with 20 teachers and 30 students

3.2 Data Collection

1. Performance metrics: Assignment completion, test scores, participation rates
2. Surveys: Likert-scale teacher feedback on usability
3. Focus groups: Student perceptions of accessibility and collaboration

3.3 Analysis

1. Quantitative data analyzed via SPSS (t-tests, $p<0.05$ significance)
2. Qualitative data thematically coded using NVivo

Results

The results demonstrate significant differences in academic performance between students using Google Classroom and those in traditional classroom settings [1]. As shown in Table 1, the Google Classroom group showed substantially higher assignment completion rates (87% vs 72%, $p<0.05$), better average test scores (82% vs 70%, $p<0.01$), lower rates of late submissions (8% vs 23%, $p<0.05$), and markedly higher student participation (91% vs 68%, $p<0.01$). These findings suggest that the digital platform positively impacts multiple dimensions of academic performance, with particularly strong effects on student engagement and timely work submission.

Table 1: Comparison of Academic Performance Metrics

Metric	Google Classroom Group (n=250)	Traditional Classroom Group (n=250)	Statistical Significance (p-value)
Assignment Completion Rate	87%	72%	$p < 0.05$
Average Test Scores (%)	82%	70%	$p < 0.01$
Late Submissions (%)	8%	23%	$p < 0.05$
Student Participation	91%	68%	$p < 0.01$

Teacher perceptions of Google Classroom, presented in Table 2, reveal generally favorable views of the platform's functionality but notable concerns about technical aspects. A large majority of teachers reported positive experiences with assignment distribution (85%) and grading efficiency (78%), while 72% observed improved student engagement levels. However, technical difficulties emerged as a significant challenge, with 45% of teachers reporting negative experiences in this area, suggesting that while the platform's educational tools are effective, reliable implementation requires addressing technological barriers.

Table 2: Teacher Feedback on Google Classroom Usage

Aspect	Positive Responses (%)	Neutral Responses (%)	Negative Responses (%)
Ease of Assignment Distribution	85%	10%	5%
Efficiency in Grading	78%	15%	7%

Student Engagement Levels	72%	20%	8%
Technical Difficulties	25%	30%	45%

Students' feedback about using Google Classroom is presented in Table 3. Students indicated high satisfaction for the aspects that are most significant. However, students also identified the same technical issues noted in previous sections that they found frustrating [2]. While the majority of students reported satisfaction with accessing materials (88%) and speed of feedback (82%), 76% reported they appreciated interacting with the collaborative features of the platform. Most significantly, this question illuminated the technical challenges of the platform as represented by 45% of students reporting dissatisfaction with this category [3]. In summary, the tensions between students' satisfaction with educational features but frustration with technical concerns suggest that schools will need to provide sufficient education technology and support for users in order to fully realize the potential of the platform [4].

Table 3: Student Perceptions of Google Classroom

Factor	**Satisfied (%)**	**Neutral (%)**	**Dissatisfied (%)**
Accessibility of Materials	88%	9%	3%
Teacher Feedback Speed	82%	12%	6%
Group Collaboration	76%	18%	6%
Technical Issues	20%	35%	45%

Discussion

The results from this study provide strong evidence regarding the transformative possibilities that Google Classroom offers in the contemporary education landscape, but it also highlighted some important challenges that need to be addressed. This quantitative data provided strong evidence for increased mean achievements in key educational indicators through the usage of this platform. In fact, 87% of students completed assigned work with Google Classroom in comparison to 72% in regular classrooms the prior semester, and students displayed an increased 12% in scores on tests [5]. These findings may support and add to existing work regarding technology use in learning environments, especially regarding how places to learn can foster more consistent participation and provide opportunities for immediate feedback to students. Additionally, the percentage of students who participated (91% - Google Classroom students; 68% - traditional classes) also support the effectiveness of this platform in maintaining student engagement in the learning process [6].
That said, the positive outcomes, exhibited through the quantitative and qualitative evidence as seen in earlier findings, need to be considered when looking at ongoing challenges. More specifically, it is alarming that 45% of both teacher and student participants reported some kind of technical issues in relation to the Google Classroom platform; this will be further addressed later in this documentation. This finding also reflects broader issues portrayed in the literature related to the digital divide and the infrastructure limitations that many schools faced [7]. The feedback from the instructors was particularly helpful, revealing that while 85% found it easier to distribute assignments, and 78% found it easier to assess students' work, many struggled with the initial setup and ongoing technical problems. Moreover, this indicates that the value of digital learning platforms - although significant - is not automatic, and effectiveness relies on proper support systems and training [8].

The student data was useful to understand how the platform impacts the learning experience [9]. The students greatly appreciated the ease of access to materials (88%) and the speed of teacher feedback (82%). However, nearly half experienced some form of technical problem, which sometimes disrupted their learning. The use of digital learning platforms creates an experience of both appreciating the

benefits, while also struggling with technical challenges. It is interesting that 76% of students enjoyed the collaborative aspects of Google Classroom as this suggests the platform does facilitate peer interaction and group work, a fundamental part of modern educational practice [10].

These findings have valuable implications for educational practice and policy. The data shows an increased level of academic performance, and engagement provide evidence that a digital learning platform such as Google Classroom can be a valuable learning tool. However, educators should understand that ease of access to technology does not equal effectiveness [11].Investments in teacher training are critical for school systems and districts to consider when adopting or using a platform, as teachers will need the technical skills and pedagogical knowledge to effectively use a platform in the classroom [12]. The problem of unequal access to technology, evident through teacher reports of technical issues, also raises a need for systemic solutions in schools if we truly care about closing the digital divide.

The study also opens up thought-provoking questions about how teaching and learning are changing in digital environments [13]. While Mexico's platform offers positive features in this regard, such as timely communications of assignments and deadlines without overlooking personal grading time, and offers increased efficiency in grading most assignments, it does not make any dimension of learning better [14]. The most valuable elements of teaching are still people - explaining, mentoring, and connecting with each other - suggesting that the best programs will continue to combine technology with the strengths of teachers' practices [15]. Some of this echoes current findings on blended learning models and the need to have the best of both in person and online [16]

As we look ahead, the findings form a number of important implications for both practice and research [17]. Within the context of schools that are currently using Google Classroom or taking it into consideration, we find evidence to support our and possibly other schools' use of Google Classroom, though the important note is that systems of support should be in place [18]. These systems must consist of not only the technical pieces of training but provide professional development that supports teachers in modifying their instructional methods to leverage the platform use to its fullest [19]. Researchers have not only documented if digital tools are effective or ineffective, but have begun to lay the groundwork on how digital tools may work best for teachers - the conditions of the implementation, supports in place, and types of intended learning objectives [20]. Future research could benefit from and should also consider longitudinal designs that study the same intervention and document the outcomes over time, ideally with studies that can combine a number of demographic studies [21].

Conclusion

The provision of this research expands our understanding of digital learning platforms by illustrating their advantages while also addressing their limitations honestly. Google Classroom is undoubtedly a useful educational resource to guide better learner outcomes when used judiciously and thoughtfully supported. However, it warrants noting that technology-related factors, such as access to training for educators, equitable access, and technical issues or challenges, can limit its effectiveness. As education changes within our increasingly digital world, the messages in the research present optimism, yet important warnings to both educators and policymakers charging forward into a complex and shifting educational technology experience.

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